Space Weather Forecast

Issued on Saturday, 20 May 2023 at 13:22 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 radio blackouts from X-ray flares likely. Chance of G1/Minor Geomagnetic Storms Days 1-2 & 4.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Moderate over the past 24 hours, with X-ray activity showing several Moderate-class flares. Flares have mostly originating from a complex region in the northeast of the disc, the largest of these resulted in an R2/Moderate Radio Blackout peaking at 20/0732UTC.

There are currently around eight sunspot regions on the visible disc. The largest and most active regions on the disc currently lie in the eastern hemisphere. The largest and most complex region has been responsible for the bulk of recent flare activity. Most of the other regions on the disc have shown little change over the period.

The Sun has seen numerous 'filaments' (arcs of plasma) become mobile or disappear in recent days, during the most recent 24-hour period a central filament was mobile for several hours at the start of the period, but perhaps not resulting in any lift-off, with no observable coronal mass ejection (CME) visible on imagery. Another filament disappeared from imagery around 19/1300UTC, this may have been the origin of a narrow and faint coronal mass ejection (CME) heading north and west in imagery, modelling suggests no Earth-directed component.
Although a number of minor coronal mass ejections (CMEs) were observed during the period, none are currently thought to be Earth-directed.

Solar Wind / Geomagnetic Activity: he solar wind, as measured by ACE at L1, was suggestive of a slow regime for much of the period, however this transitioned into a CIR-like environment during the UTC evening, possibly a precursor to anticipated CH03/-.

The solar wind speed was at slow-ambient levels at the start of the period with a slowly rising trend from 310 km/s, becoming slightly elevated around 20/0020UTC. At 20/0330UTC there was a jump in winds to 460km/s, since then winds have fluctuated between slightly elevated and elevated. From 20/2000UTC IMF stepped up from Weak, to fluctuating at Moderate to Strong levels. The important north-south component was initially small scale and stable, but this gave way in the UTC night to a larger magnitude and mostly anti-aligned (with Earth's field), it has remained moderate to strongly fluctuating since. It is assumed that a stream of fast winds from a coronal hole has arrived at Earth and is acting to enhance the solar wind strength observed.
The net effect of the above solar wind measures was for largely Quiet to Unsettled (Kp 0-3) activity, but with Minor-Moderate/G1-G2 Geomagnetic storming (Kp5-6) intervals observed 20/0000-0600UTC.

Energetic Particles / Solar Radiation: Solar radiation levels have been at Background levels throughout.

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Met Office Space Weather Forecast

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to remain moderate, with a slight chance of Strong-class X-ray flares throughout the period, with the large and complex sunspot in the northeast the most likely source of these flares, and to a lesser extent a region in the northwest. No new large regions are expected to arrive, however the growing western sunspot region leaves the facing side by Day 4 (23 May), leading to a slight decrease in flare risk by the very end of the forecast.

Solar Wind / Geomagnetic Activity: The only Coronal Mass Ejection (CME) that features in the forecast at the time of writing, from 17 May, may possibly glance Earth on or after the middle of the UTC day of 21 May (Day 2) to give a Chance of a G1/Minor Geomagnetic storm (Kp5).
Solar winds are expected to remain at or close to elevated levels through Day 1, weakly enhanced by fast winds from a coronal hole. Wind speeds are expected to wane during Day 2, before further enhancement towards the end of the period associated with the anticipated arrival of further fast winds from coronal holes.

Geomagnetic activity is expected to be initially mostly Quiet to Unsettled (Kp0-3), becoming mostly Unsettled or Active (Kp3-4) from Day 2 onwards associated with the combined effects of a potential CME glancing blow and subsequent HSS arrivals. Chance of G1/Minor Geomagnetic storm (Kp5) intervals at times throughout the period.
Energetic Particles / Solar Radiation: There is a daily slight chance of S1, largely as a result of a complex region in the eastern hemisphere, with this very gradually rising over the four days as it transits westwards.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	Yes	20	20	10	30
Strong	**G3**	No	1	1	1	10
Severe	**G4**	No	1	1	1	1
Extreme	**G5**	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	70	60
Very Active	R3 to R5 X	No	15	15	15	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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